



**MILL MEADOW RESERVOIR
2020 TREND NET SURVEY**

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BACKGROUND: Although the fishery in Mill Meadow Reservoir has experienced wide variation in species composition, the stocking of rainbow trout (RBT) has been consistent for decades. The current annual quota is set at 5,000 ten-inch (“catchable”) triploid RBT (Table 1). (Triploids are requested in order to protect the Colorado River cutthroat trout population in UM Creek upstream of Forsyth Reservoir.) Tiger and splake trout were stocked regularly after a study conducted in the mid to late 1990s to evaluate performance and resistance to whirling disease by various trout hybrids. Utah chubs (UTC), Utah suckers (UTS), and yellow perch (YLP) have maintained self-sustaining populations in Mill Meadow and often negatively impact trout survival and growth when reaching high densities. Efforts to remove these species from the reservoir prove only temporary, as they also occur upstream in Johnson Reservoir and Fish Lake. Tiger and splake trout stocking was terminated after 2010 due to poor performance in the face of this competition. Mill Meadow Reservoir is unique in that abundant wild brown trout (BRN) resulting from recruitment upstream in the Fremont River and UM Creek often dominate the trout population in the reservoir. While many anglers target RBT, self-sustaining populations of BRN and YLP often have dominated the sport fishery.

Mill Meadow Reservoir was nearly drained in late 2012 to facilitate work on the dam outlet structure. The remaining pool was treated with rotenone to reduce the UTS population, which had come to dominate the fishery (82% of biomass sampled in spring 2012). The regular RBT quota was resumed in 2013, while BRN repopulated on their own from the tributaries. In response to angler requests, YLP were reintroduced by transfer from Fish Lake in 2015. After a brief reduction following the 2012 treatment, UTS again came to dominate the fishery, achieving 70% of fish biomass by 2018 and yielding poor growth and condition of trout species.

The post-treatment annual RBT quota at Mill Meadow Reservoir was kept at 5,000 – and hybrid trout quotas remained canceled – due to an anticipated addition of hybrid saugeye (walleye x sauger), which were expected to more readily utilize YLP and UTS fry as forage. Local anglers were also highly interested in the potential new species. The state has been unable to secure saugeye for stocking, however, and development of a saugeye program in Utah’s hatcheries is not currently being pursued. Accordingly, a quota of wipers was requested for Mill Meadow Reservoir after the last trend net survey in 2018. Wipers have shown to be very effective at controlling small and medium sized cyprinids at other mid-elevation reservoirs in southern Utah. Mill Meadow Reservoir may provide a prime opportunity to evaluate wiper predation on both large-bodied suckers and YLP. The first group of 7,000 two-inch wipers was stocked in 2019 (Table 2).

The fishery at Mill Meadow Reservoir is monitored through trend net surveys conducted on even years. Since 2012 a new gill net design recommended by the American Fisheries Society (AFS) has been utilized in these surveys. The random placement of differing mesh sizes is intended to avoid “leading” fish into the net and, thus, reduce bias in the net catch – as opposed to nets previously used for decades (“DWR” nets), which were comprised of graduating mesh sizes. In most waters, catch rate trends indicate that the AFS nets catch about 50% fewer trout than did the DWR nets, though the reduced catches are still sufficient to provide measures of population dynamics. At Mill Meadow Reservoir, mean catch rate for AFS nets has been about 33% that of the old style nets, though use of the new nets also coincides with a time period of reduced trout stocking.

METHODS: Four experimental gill nets (two floating and two diving) were set in Mill Meadow Reservoir on April 28, 2020, and were allowed to fish overnight. Nets measured 6 ft x 80 ft, with eight panels of randomly-arranged mesh size (1.5”, 2.25”, 1”, 0.75”, 2.5”, 1.25”, 2”). Most net

locations have been consistent for 20+ years of sampling, though the floating net previously set on the southwest shore was moved in 2020 to a point on the east shore, just north of the dam (SEF; “southeast floater”) (Figure 1). (The southwest shore is very steep and this net consistently caught fish only in the panels closest to shore.) Fish caught were removed from nets on the morning of April 29 and all trout were measured to the nearest mm (total length) and weighed to the nearest gram. Trout body condition was measured by the calculation of Fulton’s K_{TL} (generated from total length [TL]):

$$K_{TL} = (Weight/Length^3) \times 100,000$$

A subset of UTS from each net were measured and weighed, while the remaining were counted. Total weight of UTS catch was then calculated from count and mean weight of measured fish. All UTC were measured and weighed. Results of the 2020 survey were compared with those from historic trend net surveys.

RESULTS: A total of 71 trout was collected in four nets at Mill Meadow Reservoir for a catch rate of 18 trout per net-night (Table 3). This was the highest rate observed since trout stocking was reduced in 2010 (Table 4, Fig. 2). Trout made up 33% of the total catch and just 29% of the total biomass (Fig. 3). As has been the case since 2006, BRN were the most abundant trout species sampled and spanned at least four size classes (Fig. 4, 5). BRN averaged 358 mm (14 in) in total length (TL), 593 g (1.3 lbs) in weight, with a mean condition (K_{TL}) of 0.86. Length and condition were similar to long-term means, while weight was higher (Table 4). Mean BRN weight was elevated by three large individuals measuring up to 673 mm (26.5 in) and weighing up to 4,030 g (8.9 lbs) (title page). The remainder of the trout catch was comprised of 20 splake trout, 9 RBT, and 7 tiger trout (Fig. 6). The splake and tiger trout had migrated downstream when Forsyth Reservoir was drawn low in 2018 and measured 320-400 mm (Fig. 7). (Concurrent netting at Forsyth Reservoir found that most splake left the reservoir in 2018.) All RBT collected were stocked in April 2019 and had grown, on average, 84 mm (3.3 in) in the year since they were stocked, for a growth rate of just 0.22 mm/day. Most trout collected exhibited poor body condition (Fig. 5, 6), with mean K_{TL} of all varieties registering less than 0.90 (Table 3). The larger brown trout exhibited the healthiest conditions, at 1.08-1.32.

UTS spanning at least three size classes (Fig. 8) made up 66% of the total net catch and 71% of the biomass sampled (Table 3). UTS catch rate (36 per net-night) continued an increasing trend observed since the 2012 rotenone treatment (Table 4, Fig. 9) and reached the highest level since documentation efforts began in 2006. (Prior to that time, netting surveys were often designed to avoid catching suckers.) UTS ranged in size up to 562 mm (22 in) and 1,923 g (4.2 lbs). Four UTC measuring 143-216 mm were also caught. Wipers and YLP were absent from the catch.

DISCUSSION: UTS abundance continued to increase at Mill Meadow Reservoir in 2020 (Fig. 9). Despite this increase, relative biomass of trout remained near 30% (Fig. 3), thanks to additions to the trout catch of larger brown trout and splake escaped from Forsyth Reservoir. Without these atypical catches, trout biomass would have dropped to a level similar to the low end in 2012. The large brown trout demonstrated that fish that are able to convert to piscivory can perform well in the face of UTS competition. The remainder of trout sampled, however, exhibited very poor condition.

A limited trout fishery, characterized by poor growth, should be expected to continue at Mill Meadow Reservoir in the foreseeable future, until effective predators can be established.

The lack of wipers in the 2020 net catch was not concerning as experience at other reservoirs has shown that wipers are not very susceptible to littoral zone gill nets until their second or third season in the reservoir. Inconsistencies in hatchery production led to stocking adjustments in 2020, with two wiper groups being stocked: 3,000 nine-inch fish and 1,500 four-inch fish. Due to challenges faced by the state's wiper program, the four-inch quota will continue at Mill Meadow Reservoir. Biennial trend net surveys will continue in order to evaluate wiper performance and UTS population dynamics. If wipers are unsuccessful, then other coolwater predators (saugeye, tiger muskies) should still be considered for addition to the reservoir in the future. While YLP have not been observed in the three surveys since they were reintroduced, anglers have reported catching limited numbers. It is probable that competition with UTS is also affecting YLP abundance, so introducing more would not benefit the population at this time.

Multiple RBT were observed in the 2016 trend net survey at Forsyth Reservoir, despite no stocking of RBT occurring there for many years. In addition, YLP reappeared in angler catches at Forsyth in 2020. These fish likely originated in Mill Meadow Reservoir and reached Forsyth by two possible avenues: 1. illegal transfer or 2. travelling up UM Creek and through the Forsyth dam during low water periods. Fertile RBT pose a threat to the population of native Colorado River cutthroat trout in UM Creek upstream of Forsyth Reservoir. Regardless of the method of introduction, it is imperative that only sterile (triploid) RBT be stocked in Mill Meadow Reservoir to eliminate the threat of hybridization in upper UM Creek. An additional safeguard to fish movement will be employed in 2021 with the construction of a fish passage barrier in UM Creek upstream of Mill Meadow Reservoir.

RECOMMENDATIONS:

1. Maintain annual stocking quotas of 5,000 catchable triploid RBT and 1,500 4-inch wipers at Mill Meadow Reservoir.
2. Conduct trend net surveys on even years.
3. Continue to explore options for creating a saugeye program in Utah.

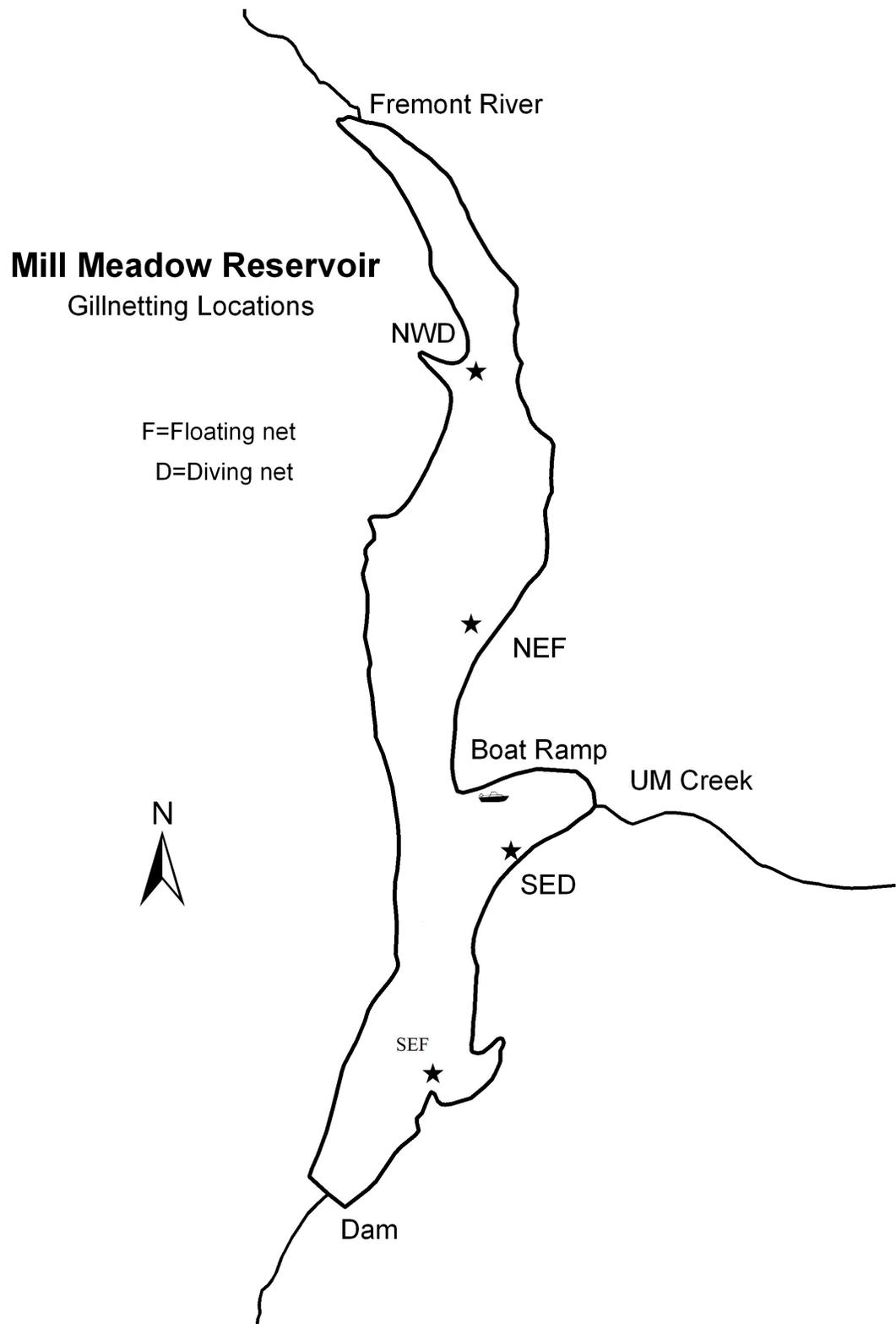


Figure 1. Locations of gill nets set at Mill Meadow Reservoir during the 2020 trend net survey.

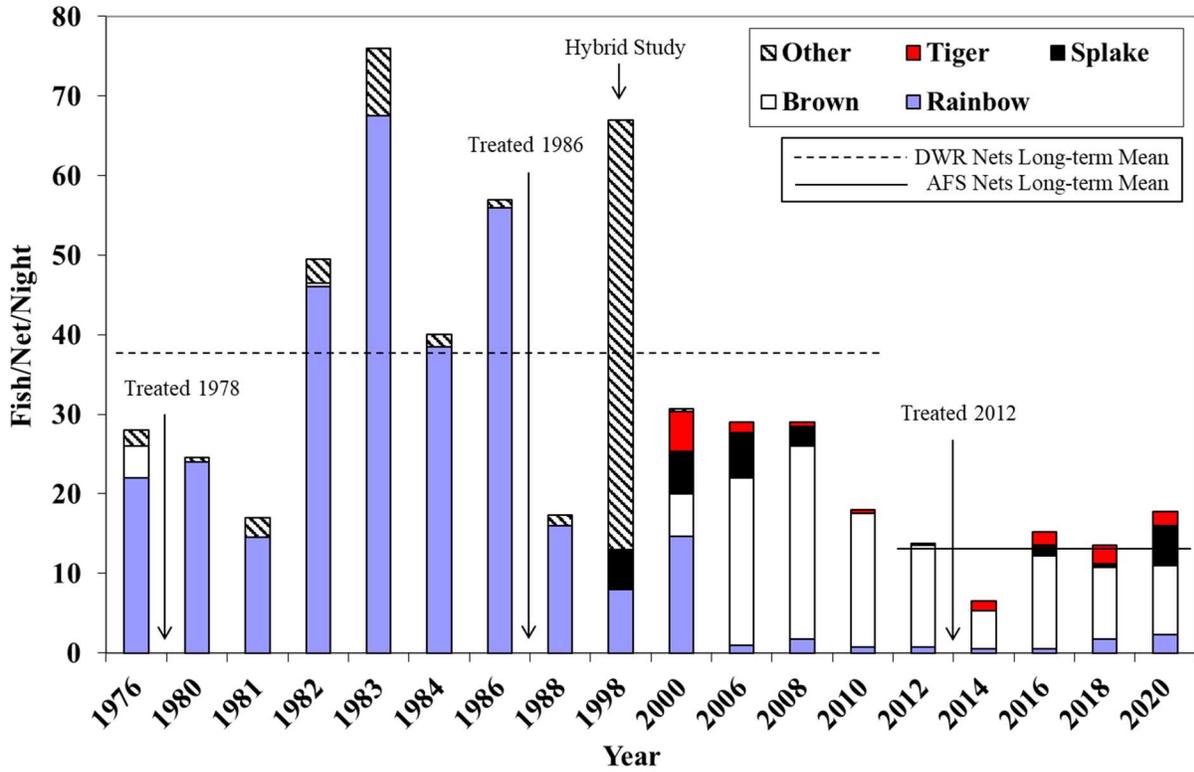


Figure 2. Trout catch rate during trend net surveys at Mill Meadow Reservoir, 1976-2020.

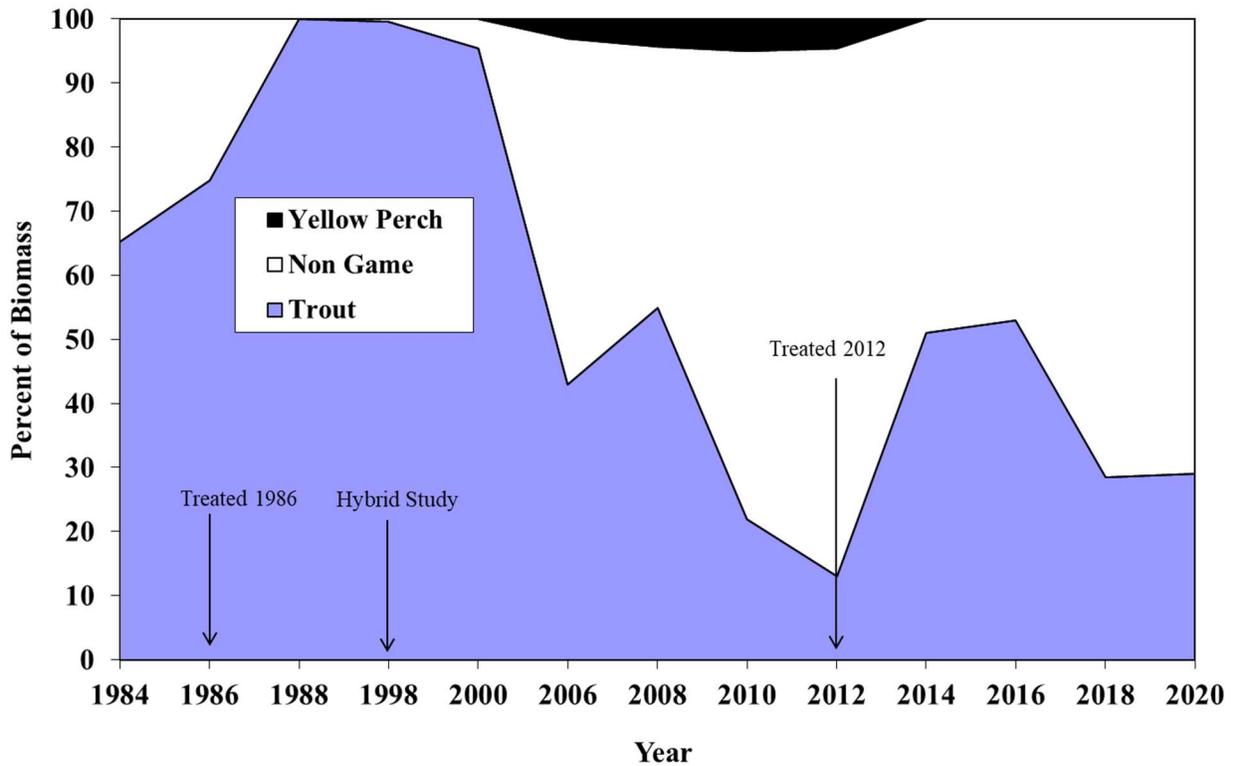


Figure 3. Relative biomass of fish collected during trend net surveys at Mill Meadow Reservoir, 1984-2020. ("Non Game" = Utah suckers and Utah chubs.) During surveys prior to 2006, perch were not observed and sampling was often designed to avoid catching non game fish.

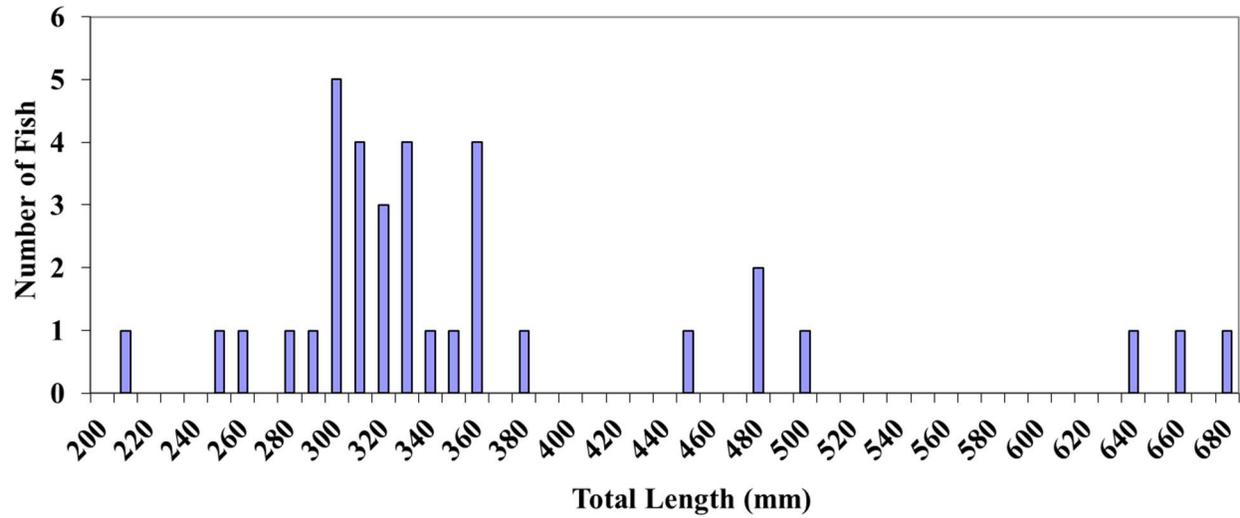


Figure 4. Length distribution of brown trout collected at Mill Meadow Reservoir on April 29, 2020.



Figure 5. Brown trout collected at Mill Meadow Reservoir on April 29, 2020.



Figure 6. Tiger (top), rainbow (middle) and splake (bottom) trout collected at Mill Meadow Reservoir on April 29, 2020.

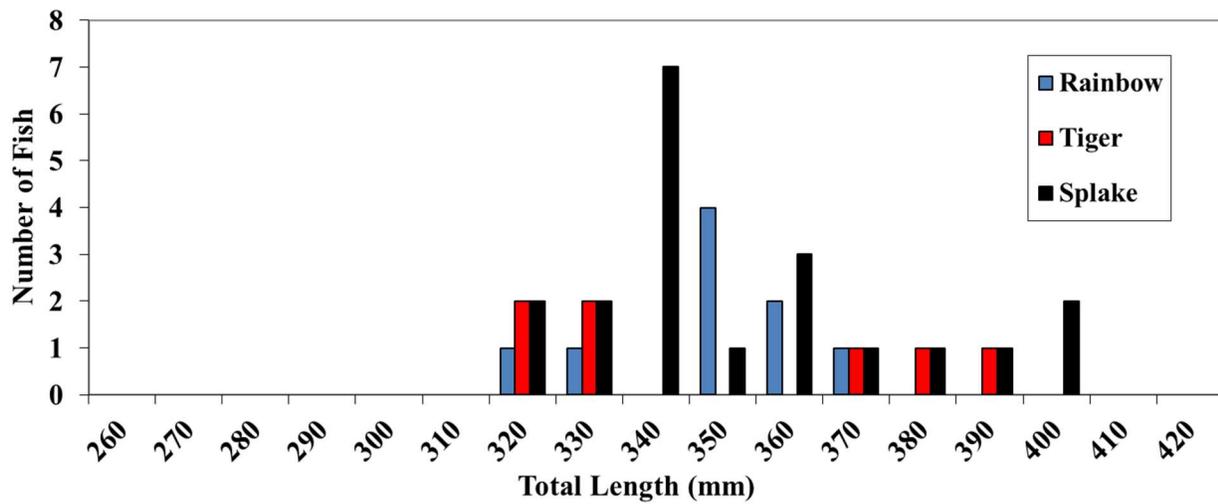


Figure 7. Length distribution of rainbow, splake, and tiger trout collected at Mill Meadow Reservoir on April 29, 2020.

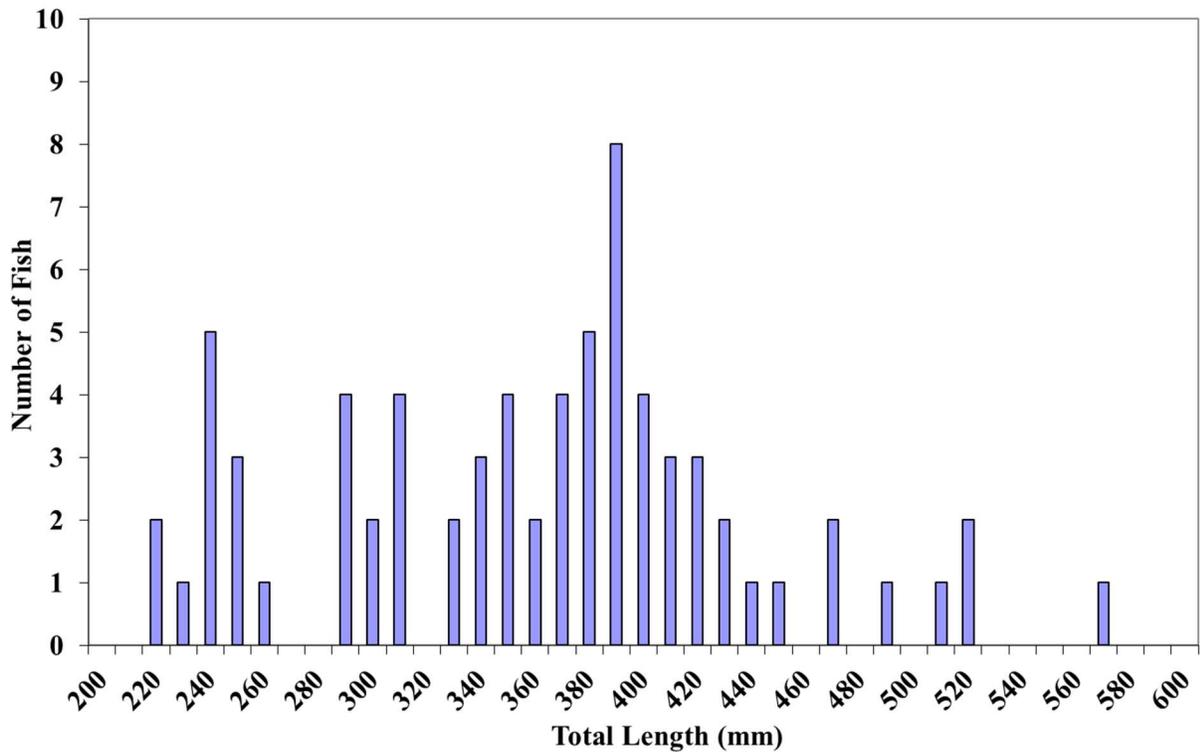


Figure 6. Length distribution of Utah suckers collected at Mill Meadow Reservoir on April 29, 2020.

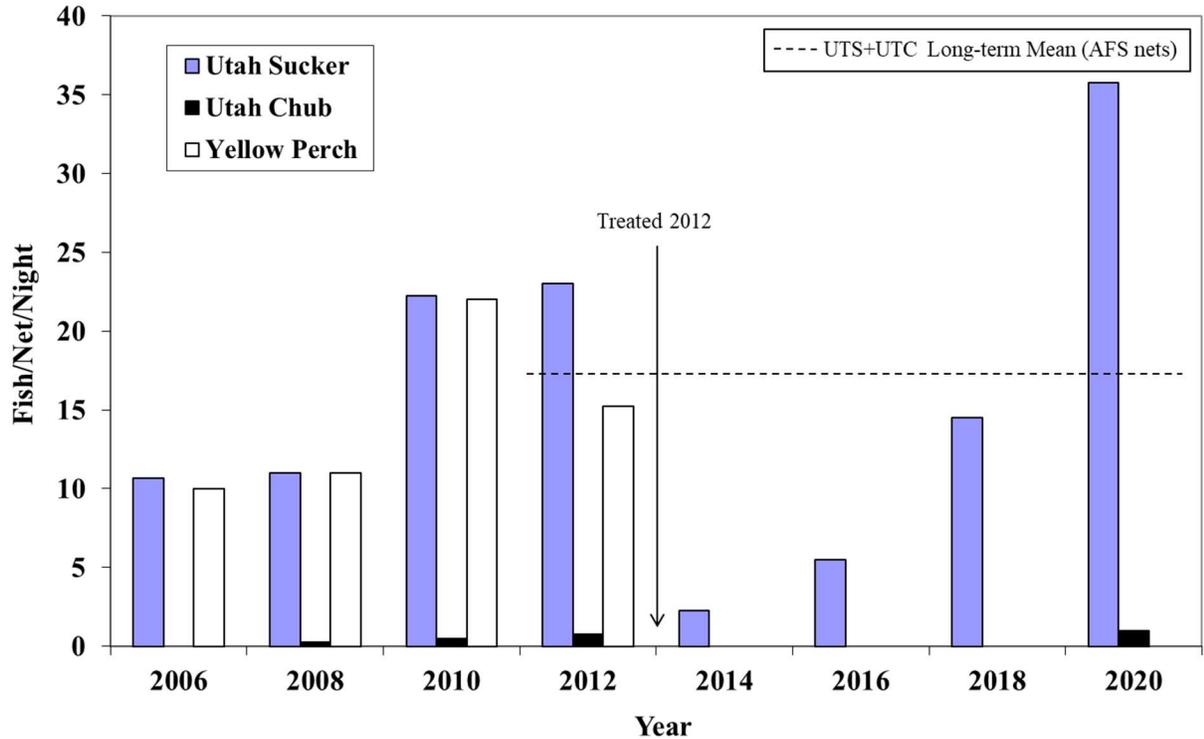


Figure 7. Catch rate of Utah suckers, Utah chubs, and yellow perch during trend net surveys at Mill Meadow Reservoir, 2006-2020. During surveys prior to 2006, perch were not observed and sampling often was designed to avoid catching non game fish.

Table 1. Record of trout stocking in Mill Meadow Reservoir for the five years prior to the 2020 trend net survey.

| <u>Rainbow Trout</u> | | |
|-----------------------------|----------------------|-------------------------|
| <u>Year</u> | <u>Number</u> | <u>Size (in)</u> |
| 2015 | 5,006 | 8.7 |
| 2016 | 5,000 | 9.8 |
| 2017 | 5,001 | 9.6 |
| 2018 | 4,999 | 8.9 |
| 2019 | 5,053 | 10.2 |
| <i>2020</i> | <i>5,000</i> | <i>10.0</i> |
| <i>Quota</i> | | |

Table 2. Record of wiper stocking in Mill Meadow Reservoir in 2019.

| <u>Rainbow Trout</u> | | |
|-----------------------------|----------------------|-------------------------|
| <u>Year</u> | <u>Number</u> | <u>Size (in)</u> |
| 2019 | 7,110 | 1.9 |
| <i>2020</i> | <i>7,000</i> | <i>2.0</i> |
| <i>Quota</i> | | |

Table 2. Summary of the results from the 2020 trend net survey at Mill Meadow Reservoir.

| Water: | Mill Meadow Reservoir | | | Catalog #: | I 512 | | | | | | | | | | | |
|-----------------------------------|-------------------------------------|---------------|---------------------|--------------------|---|--------------------|-------------|------|---------|-----------------|------|-----------|---------------|-----------------|---------------|-----------------|
| Date Set: | 4/28/2020 | | Time Set: | 13:00 | | Weather: | Calm, sunny | | | | | | | | | |
| Date Pulled: | 4/29/2020 | | Time Pulled: | 9:00 | | Water Temp: | 50 F | | | | | | | | | |
| # Nets: | 2 floaters, 2 divers; AFS design | | | Collectors: | M. Hadley, M. Roundy, T. Utley, S. Dalebout, R. Griffiths, J. Swensen | | | | | | | | | | | |
| Summary for Sport Fish | | | | | | | | | | | | | | | | |
| Species | N | Total Wt (kg) | fish per net/night | Total Length (mm) | | | Weight (g) | | | Condition (Ktl) | | | % total catch | % total biomass | % trout catch | % trout biomass |
| | | | | Mean | SE | Range | Mean | SE | Range | Mean | SE | Range | | | | |
| Brown Trout | 35 | 20.76 | 8.75 | 358 | 18.7 | 207-673 | 593 | 152 | 84-4030 | 0.86 | 0.02 | 0.65-1.32 | 15.77 | 18.19 | 46.67 | 62.58 |
| Rainbow Trout | 13 | 3.92 | 3.25 | 325 | 8.93 | 271-362 | 305 | 18.7 | 215-437 | 0.88 | 0.04 | 0.65-1.10 | 5.86 | 3.43 | 17.33 | 11.80 |
| Splake Trout | 20 | 6.45 | 5.00 | 349 | 5.65 | 311-400 | 323 | 10.8 | 263-471 | 0.77 | 0.02 | 0.48-0.97 | 9.01 | 5.65 | 26.67 | 19.44 |
| Tiger Trout | 7 | 2.05 | 1.75 | 343 | 11.1 | 315-385 | 293 | 16.5 | 254-353 | 0.73 | 0.03 | 0.62-0.83 | 3.15 | 1.80 | 9.33 | 6.18 |
| Trout | 75 | 33.18 | 18.75 | 349 | 9.09 | 207-673 | 442 | 72.6 | 84-4030 | 0.83 | 0.02 | 0.48-1.32 | 33.78 | 29.07 | --- | --- |
| Summary for Non-Sport Fish | | | | | | | | | | | | | | | | |
| Species | N | Total Wt (kg) | fish per net/night | % total catch | % total biomass | TL range (mm) | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| Utah Sucker | 143 | 80.63 | 35.75 | 64.41 | 70.65 | 218-562 | | | | | | | | | | |
| Utah Chub | 4 | 0.31 | 1.00 | 1.80 | 0.28 | 143-216 | | | | | | | | | | |
| Comments: | SWF moved to SE shore to become SEF | | | | | | | | | | | | | | | |

Table 3. Trend net survey results at Mill Meadow Reservoir, 1976-2020.

| Date | Net Sets | | All Trout | | | Rainbow trout | | | Brown Trout | | | Yellow Perch | Yellow Perch | | Total | Comments |
|-------------------------|----------|-----|-------------|-----------|--------------|---------------|----------|--------------|-------------|----------|-------|--------------|--------------|---------|-------------------|----------|
| | Flo | Div | Total Trout | Per | All Ages | | Mean Ktl | All Ages | | Mean Ktl | Perch | All Ages | | Nongame | | |
| | | | | Net-Night | Mean TL (mm) | Mean W (g) | | Mean TL (mm) | Mean W (g) | | Perch | Mean TL (mm) | Mean W (g) | Perch | | |
| 10-May-76 | 1 | 0 | 28 | 28 | 249 | 186 | 1.20 | 384 | 625 | 1.06 | | | | 22 | | |
| 22-May-80 | 1 | 1 | 49 | 25 | 294 | 277 | 1.06 | | | | | | | 0.5 | Treated 1978 | |
| 1-May-81 | 0 | 2 | 34 | 17 | 303 | 303 | 1.02 | | | | | | | 0 | | |
| 26-May-82 | 1 | 1 | 99 | 50 | 256 | 213 | 1.03 | | | | | | | 0 | Forsyth drained | |
| 10-May-83 | 2 | 0 | 152 | 76 | 274 | 205 | 0.95 | | | | | | | 1.5 | | |
| 10-May-84 | 2 | 0 | 80 | 40 | 261 | 166 | 0.91 | | | | | | | 8 | | |
| 13-May-86 | 2 | 0 | 114 | 57 | 301 | 270 | 0.99 | | | | | | | 7 | Treated Fall 1986 | |
| 12-May-88 | 2 | 2 | 52 | 17 | 332 | 457 | 1.18 | | | | | | | 0 | | |
| 11-May-98 | 2 | 2 | 268 | 67 | 354 | 560 | 1.14 | | | | | | | 1 | Hybrid study | |
| 16-May-00 | 2 | 1 | 92 | 31 | 330 | 431 | 1.16 | 339 | 426 | 1.01 | | | | 0.33 | | |
| 4-May-06 | 1 | 2 | 87 | 29 | 341 | 432 | 1.10 | 331 | 362 | 0.94 | 10 | 175 | 82 | 11 | Sampled by FES | |
| 29-Apr-08 | 2 | 2 | 116 | 29 | 339 | 456 | 1.04 | 346 | 378 | 0.87 | 11 | 178 | 79 | 11 | | |
| 5-May-10 | 2 | 2 | 72 | 18 | 331 | 397 | 1.06 | 356 | 418 | 0.82 | 22 | 194 | 75 | 23 | | |
| 3-May-12 | 2 | 2 | 55 | 14 | 349 | 439 | 1.03 | 331 | 335 | 0.86 | 15 | 203 | 110 | 24 | | |
| 30-Apr-14 | 2 | 2 | 26 | 7 | 351 | 466 | 1.08 | 344 | 422 | 0.99 | 0 | | | 2 | Treated 2012 | |
| 27-Apr-16 | 2 | 2 | 61 | 15 | 380 | 583 | 1.06 | 379 | 487 | 0.85 | 0 | | | 6 | | |
| 25-Apr-18 | 2 | 2 | 54 | 14 | 322 | 303 | 0.91 | 362 | 397 | 0.81 | 0 | | | 15 | | |
| 29-Apr-20 | 2 | 2 | 75 | 19 | 325 | 305 | 0.88 | 358 | 593 | 0.86 | 0 | | | 37 | | |
| Long-term mean | | | | 31 | 291 | 281 | 1.02 | 350 | 413 | 0.88 | 7 | 191 | 86 | 9 | | |
| DWR Nets (1976-2010) | | | | 37 | | | | | | | 14 | | | 7 | | |
| AFS Nets (2012-present) | | | | 14 | | | | | | | 3 | | | 17 | | |